

Bachelor-/Masterthesis/FP/IP



Technische Universität München



Fakultät für
Elektro- und Informationstechnik
Lehrstuhl für
Messsystem- und Sensortechnik

Characterization and Optimization of a photonic–electronic integrated circuit to measure Fiber Bragg Gratings

Fiber optic measurement of strain, acceleration and temperature, based on Fiber Bragg Grating, is becoming an accepted standard in the industry. The increased use of fiber-optic sensors calls for further developments, because the industry is requiring cost-optimized interrogators for monitoring chosen assets. Today's edge filter interrogators fill this gap. But because of the optical tolerances of used components, those components need to be manually positioned within the optical electrical converter chip to tune the performance to its optimum, which is limiting scalability in production. Photonic electronic integrated circuits (PIC) use modern semiconductor technology on wafers and are easily scalable, having lower tolerances and additionally pricing can be more competitive at higher quantities.

The main difference between a PIC chip and an integrated circuit is that the integrated circuit consists of many transistors, diodes and capacitors, whereas a PIC chip contains optical components such as laser diodes, modulators, photodetectors, optical multiplexers, optical amplifiers and imprinted waveguides. Hybrid PICs integrate various individual optical components in a single package and can be combined with electronic integrated circuits.

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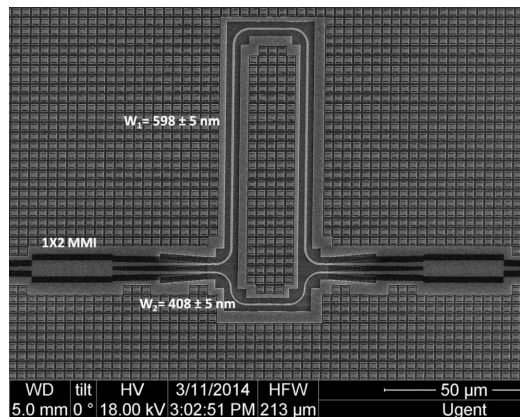
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fos4X, a former spin-off of the TUM MST, is researching such a photonic–electronic integrated circuit for industrial use.

In this scientific work a photonic electronic integrated circuit needs to be characterized and additionally optimized by minimizing the absolute measurement uncertainty and improving robustness. The activities will take place at the company fos4X, Munich. Experience with fiber optics is an advantage but not mandatory. The work also offers a good balance between theory and practical development.